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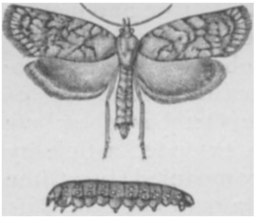
Additions to the Habitats of N. A. Sphagna. The General and Editorial Notes are full, and well selected. Among these we notice the discovery of a grass, *Graphephorum festucaceum*, from Northern Iowa. It has hitherto been known only from the Saskatchewan region, northwestward to Alaska. This northern grass may well serve as a companion with *Adoxa moschatellina*, also a far northern plant found a few years since in Northern Iowa.——General Benjamin Alvord, publishes in the Bulletin of the Am. Geographical Society, No. 4, a valuable paper on Winter grazing in the Rocky Mountains. Its chief interest to us in this place is its discussion of the grasses of that region.——We fell into an error in our notice (in the February NATURALIST) of very simple prothallia of a fern (*Onoclea struthiopteris*) grown by D. H. Campbell. The autheridia were not one-celled, as we understood from the drawing and description, but several-celled.

ENTOMOLOGY.

THE SPRUCE-BUD TORTRIX.[1]—The habits of this insect while in confinement were first studied by Professor C. H. Fernald, of the Maine State Agricultural College, Orono, Me., and his account published in the AMERICAN NATURALIST for January, 1881. In the account of the ravages of a caterpillar on the spruces on the coast of Maine in Bulletin 7 of the United States Entomological Commission, we refer to this insect, which we were unable to identify, as, after repeated search in the latter part of the summer, we failed to discover any traces of the insect in any stages. In our account we gave greater prominence to the operations of borers and bark beetles than to those of this caterpillar; and while considerable damage was undoubtedly done to spruces and firs in Sagadahoc and Cumberland counties by those beetles, from farther inquiries and field-work carried on in June and July, 1883, in different parts of Maine, we now have little doubt but that the destruction of spruces and firs along the coast of the State was mainly due to the attacks of this insect.



The different climatic causes alleged to destroy forest trees in general, would, in the present case, have injured pines and hardwood trees, as well as spruces and firs, and the destruction would have been general; whereas the trees have been killed by a caterpillar which we have never found upon pines nor any trees but spruce, fir, and occasionally the hemlock and larch. Individual trees, or clumps of trees, were attacked, whether in high and exposed situations or in hollows; occasionally from such centers the worms seem to have increased and spread from year to year, until all the trees in localities several square miles in extent were killed. Moreover, as we have seen in the case of the attacks of the larch worm, the defoliation of spruces and firs repeated two and perhaps three summers is sufficient to either kill the tree outright, or so weaken it that bark-boring beetles can complete the work of destruction. We are now inclined to the opinion, then, that the bud Tortrix is the sole or at least main cause of the destruction of spruces and firs in Cumberland and Sagadahoc and Lincoln counties, Maine, and that by their attacks they render the trees liable to invasion by hosts of bark beetles.

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[1] Extracted from the report of the Entomologist (Professor C. V. Riley) of the Department of Agriculture for 1883.

The spruce-bud worm, as we observed in Cumberland county, also at Phillips, and near the Rangeley lakes, on the road from Phillips to Rangeley, where the trees by the roadside, as well as in the woods, were attacked by them, so that they looked as if a light fire had passed through them; feeds upon the leaves or needles of the terminal shoots, both the first and previous year's growth. The worm gnaws the base of the needles, separating them from the twig, meanwhile spinning a silken thread by which the needles and bud-scales are loosely attached to the twig; the worm moving about in the space between the twig and the loosened needles and bud-scales, and not living, like many leaf-rolling caterpillars, in a regular tube.

The caterpillar sometimes draws together two adjacent shoots, but this is rarely done; hence while it is at work it scarcely alters the appearance of the tree, and its presence is only known when the worms are abundant enough to partly defoliate the trees.

The worms in June, 1883, were in Cumberland county most abundant where the dead or partially dead spruces abounded; but individual worms could be obtained by beating any spruce or fir in any locality, showing that in years of immunity from its attacks the insect is a common and widespread species. We found the worms most abundant in spruces, firs, and even hemlocks, July 1 and 2, between Phillips and Rangeley, but after passing through all the Rangeley lakes, and going from Errol, N. H., to Berlin, Gorham, Jackson, and Conway, N. H., we found that the spruces and firs throughout Northwestern Maine and the White Mountain region had suffered no widespread damage. One and perhaps two rather extensive tracts of dead spruces were observed at a distance from the stage road near Rangeley, but throughout the vast spruce-clad forests observable from the lakes themselves, no such tracts of dead trees were to be seen. On the contrary, the spruce forests of the Rangeley Lake region appeared to be as green and fresh as any forest we have ever seen. The dead spruces at the water's edge of the middle lakes were evidently due to the high water held in by the middle and lower dams during the last two years. As in any forest, there were individual dead trees, sometimes small clumps of them, where the trees had died as the results of tornadoes or of borers. The persons living by the lakes, lumbermen and others, informed us that there had been no extensive destruction of evergreen trees in this region.

The spruce-bud worm attains its full size and stops feeding, ready to transform to a chrysalis, in Cumberland county, by the 20th to 30th of June, and about the Rangeley lakes and in the White Mountain region a few days or nearly a week later.

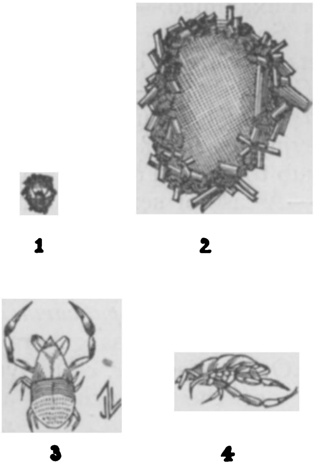
When about to change to a pupa it remains in its rude shelter or hiding-place under the loosened leaves of the shoot, where it turns to a chrysalis, without spinning a regular, even, thin cocoon. It remains in the chrysalis state about six days. Those pupating at Brunswick, Me., June 28 and 29, issued as moths July 4 and 5. When the moth is ready to break forth from the pupa, the latter wriggles part way out of its hiding-place, and the moth issues, leaving the rent pupa skin projecting half way out of the end of the shoot. The moths then appear from the first to the middle of July. July 16, after our return from an absence of two weeks, we found that the moths of both sexes had issued, and that the females had laid their eggs in curious little patches on the sides of the breeding-box. They must have issued about the 5th to 7th of July, and immediately laid their eggs, as in one patch the shells were empty, with a small orifice in the shell, out of which the larvæ had crept. Another patch was found with a dark spot in each egg, showing the head of the embryo caterpillar; these hatched July 18, 19. It thus appears that the embryo develops, and the caterpillar hatches, in about ten days after the eggs are laid.

The eggs are very curious and very unlike those of most moths. They are pale-green, scale-like, broad, flat beneath, moderately convex above, oval cylindrical, a little longer than broad, and in all those which I examined, both those containing the embryos, and those which were empty, the surface, contrary to Professor Fernald's statement, was under a lens seen to be finely but irregularly granulated. The shell is thin, and at first unusually soft. Length, 0.9–1.4^{mm}; breadth, 0.8–1^{mm}. The patches were about 3^{mm} in diameter, and composed of as many as 30 eggs. The eggs overlapped each other irregularly, leaving about a third or fourth of the surface of each egg exposed.

From the form and size of the egg-mass it is evidently attached by the moth to a terminal twig. The caterpillars on hatching do not, as Fernald observes, eat the shell. They hatch about or soon after the middle of July, and it is most probable that the caterpillars become partly, perhaps almost wholly, grown before the end of autumn, and pass the winter among the terminal shoots of the tree, to finish their transformations the following June and July. It is certain that there is but a single brood of caterpillars. Professor Fernald, in his article in the AMERICAN NATURALIST, describes the process of egg-laying. He has bred from the worms an ichneumon (*Pimpla conquisitor*), several dipterous parasites and a hair-snake. We have found the insect to be remarkably free from parasites, having bred about 25 of the moths without rearing any parasites.—*A. S. Packard, Jr.*

Nest of the Pseudo-Scorpion.—In confirmation of the reference to this subject in "Packard's Guide to the Study of Insects," fourth edition, p. 658, I found, Feb. 5, 1884, a pseudo-scorpion, which had died in its nest, in the act of molting. The nest was made at the edge of a piece of paper lying on a beam in a garret. When the paper was removed, the nest still adhering to the edge, had its lower surface torn open, disclosing the dead insect. The nest (Fig. 1, under side, nat. size; Fig. 2, upper side, enlarged five diameters), was oval in outline, two-tenths of an inch long. Its lower surface was a flat, white web of extremely thin, translucent texture. Its upper surface was slightly convex, firmer and darker than the lower, and the entire edge was bordered with minute pieces of sawdust, firmly glued to the web. The insect was about half withdrawn from its old integument (Fig. 3, view from above; Fig. 4, view from the side, both enlarged five diameters).

This molted covering was entire, although wrinkled on the back, reaching nearly its original position at the head; but underneath it was ruptured on each side, from the head backwards to about two-thirds of its length, somewhat resembling a pair of opening oyster shells. The empty coverings of the large maxillary palpi were extended, in perfect condition, still bearing the prominent long hairs on the forceps. But the molted palpi themselves were bent downwards and backwards, with their tips extending under the abdomen, where also all the legs were gathered with their tarsi placed together.—*J. L. Zabriskie, Nyack, N. Y.*



Pseudo-Scorpion's nest.

Fig. 1.—Under side of nest, nat. size. Fig. 2.—Upper side of nest, enlarged. Fig. 3.—Pseudo-scorpion view from above. Fig. 4.—Do. view from the side.—*J. L. Zabriskie.*

Entomological News.—*Papilio* closes its third volume with an excellent triple number. The transformations of *Hemaris uniformis*, *Darapsa chœrilus*, *Cressonia juglandis*, *Sphinx chersis*, *Phragmatobia rubricosa*, *Deiopeia bella*, *Parasa chloris*, *Limacodes scapha*, *Adoneta spinuloides*, *Gluphisia trilineata*, *Notodonta stragula*, *Œdemasia concinna*, *Cerura cinerea*, *Tolype velleda* and *laricis* and several Noctuids, with the geometrid *Amphidasis cognataria*, are described by H. Edwards and S. L. Elliott. Mr. H. Edwards limits the species of Euchetes, and shows by Mr. Elliott's observations on the larvæ, that *E. collaris* is a different species from *E. eglenensis*. The genus Arctia and its variations are discussed by B. Neumogen with the result of reducing several so-called species to varieties. Mr. W. H. Edwards comments at length on Hagen's views on the genus Colias; while W. Schaus, Jr., describes the early stages of some Mexican Lepidoptera. We regret to notice that Mr. Edwards is unable to conduct this very successful journal, which will hereafter be published by Mr. E. M. Aaron, P. O. Box 2500, Philadelphia, Pa.——An elaborate essay on the thoracic muscles of insects, by C. Luke, appears in the Jena *Zeitschrift*, for Oct. 13, '83. With the exception of the Thysanura (including the Collembola) insects of all orders have been examined.——The Quarterly Journal of the Boston Zoölogical Society, for Jan., prints valuable notes on the habits and metamorphoses of *Hydrocharis obtusatus* and *Magdalis olyra*, by F. C. Bowditch.——Dr. Hagen states in the *Entomologist's Monthly Magazine*, for Jan., that he saw at Wood's Holl *Anax longipes* preying upon *Papilio asterias*, catching them and settling on a shrub to behead and devour them. This is a rare southern form. ——A case of sex-dimorphism in the Psocidæ is noticed by Ph. Bertkau (Archiv. für Natur., 1883). In *P. heteromorphus* the wings of the male are long, while those of the female are short. In *Trocticus gibbulus*, n. g. and sp., the wings are short in both sexes. *Lapithes pulicarius* is a wingless Psocid, which differs from other wingless genera in the antennæ, palpi, and maxillæ. Dr. Otto Geise (*loc. cit.*) gives a minute description of the mouth parts of the Rhynchota, as exemplified by *Notonecta glauca*, *Nepa cinera* and *Corixa striata*.——H. J. Kolbe. (Archiv. für Natur., 1883) characterizes forty-three species of Dytiscidæ from Madagascar, in the entomological museum of Berlin, and diagnoses twenty other species found in Madagascar, as well as six found on the surrounding islands only. The usual world-wide genera occur in Madagascar, but numerous small species are peculiar. Genera, not common to Madagascar and the Oriental region, do not occur in Australia. The genera *Bidessus* and *Copelatus*, which are probably oldest phylogenetically, are most abundant in Australia, and occur but sparsely in Asia, Africa, and Madagascar. Most of the genera are richer in species in Madagascar and the Oriental region than in Africa. The smallest species are nearer to those of the Oriental and Australian fauna, than to those of Ethiopian; and, on the whole, the Dytiscidæ of Madagascar are nearer those of the two former faunæ than they are to those of the latter.——Mr. G. C. Chapman relates in the *Entomologist's Monthly Magazine*, for January and February, his interesting experiences during four years' collecting in Central America, where he obtained not less than 15,000 species of insects, the greater part of which will probably be catalogued in Godman and Salvin's Zoölogy of Central America.——Obituary notices of the late Dr. John L. LeConte, by Professor J. P. Lesley and Dr. Horn, were read before the American Philosophical Society; in the latter's notice it is stated that LeConte described more than 500 genera and nearly 5000 species, three-fourths of the latter remaining valid; but, it is added, that his work was notable for his breadth of view as well as analytical powers.